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MILSTAR MASTER PLAN

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I. BACKGROUND (U)

A. In 1980 an assessment of the capabilities and capacities of each of the existing four Military Satellite Communications (MILSATCOM) systems (Defense Satellite Communications System (DSCS), Fleet Satellite Communications (FLTSATCOM) System, Air Force Satellite Communications (AFSATCOM) System, and Commercial Satellite Communications (SATCOM) Systems) identified critical shortfalls that could prove catastrophic during crisis situations, conventional and general nuclear war.

B. (U) In April 1981, the Deputy Under Secretary of Defense for Command, Control, Communications, and Intelligence (DUSD/C^3I), issued a memorandum directing the formulation of the Milstar Satellite Communications Program. The system is designed to overcome the shortfalls of the existing MILSATCOM systems and to provide the communications necessary to achieve our Defense and National goals.

II. (U) System Description

A. (U) Milstar will provide worldwide, survivable and enduring communications services to strategic and tactical forces. The system will function via the coordinated interactions of three distinct segments: (1) the space segment comprised of a constellation of earth-orbiting satellites which provide worldwide coverage; (2) the control segment comprised of communications network management capabilities of the Network Control Stations (NECOSs) and a flexible dedicated Mission Control Segment (MCS) for the spacecraft control functions that monitor constellation health, perform orbital maintenance and communications resource management support, and the overall support facilities to perform these functions; and (3) the terminal segment, comprised of three functionally similar but different designs of interoperable satellite communications terminals by each Service which are distributed among the users to provide secure telecommunications. The Milstar system configuration is shown in Figures 1 & 2.

1. (U) Space Segment. The space segment will consist of the FLTSATCOM Extremely High Frequency (EHF) Packages (FEPs) and the Milstar satellites.

a. (U) FEP. Two FLTSATCOM satellites are equipped with EHF Milstar compatible payloads. The FEP is hosted on the FLTSATCOM F-7 and F-8 satellites. F-7 was launched on 4 December 1986 and F-8 was launched on 25 Sep 89. The geosynchronous orbit location of F-7 is 100 degrees west and is 23 degrees west for F-8. The FEP program has two objectives:

(1) (U) To provide an on-orbit vehicle for DT&E/OT&E of Milstar EHF terminals.

(2) To provide a potential capability to support limited critical connectivity to the National Command Authority.

b. (U) Milstar Satellites

(1)

Each satellite contains a communications payload to provide EHF and UHF communications capability, and an on-board Data Processing Subsystem (DPS) that, together with the satellite software subsystem, supports autonomous control of the payload and spacecraft for extended periods of time.

(2) (U) The spacecraft provides attitude control, electrical power generation and distribution, structural support, and thermal control for the satellite

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MILSTAR SYSTEM

- MISSION
  - —ANTIJAM, SECURE, SURVIVABLE COMMUNICATIONS
  - —NCA AND CINCs
  - —STRATEGIC AND TACTICAL FORCES
  - —ALL LEVELS OF CONFLICT
- COMMUNICATION CAPABILITIES
  - —EHF (44 GHz UP, 20 GHz DOWN)
  - —UHF (350 MHz UP, 250 MHz DOWN)
  - —ENCRYPTED VOICE / DATA, TELETYPE
  - —MULTINETWORK SWITCHING
  - —SIGNAL PROCESSING
- SATELLITES
  - —GEOSYNCHRONOUS AND INCLINED ORBITS FOR TOTAL EARTH COVERAGE
  - —CROSSLINKING
  - —FIXED AND AGILE BEAMS
  - —SURVIVABILITY FEATURES
  - —NUCLEAR HARDENING
- MISSION CONTROL
  - —DISTRIBUTED MOBILE CONTROL CENTERS
- TERMINALS
  - —WORLDWIDE DEPLOYMENT
  - —AIRBORNE/SHIPBORNE/GROUND

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Figure 1

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MILSTAR CONFIGURATION

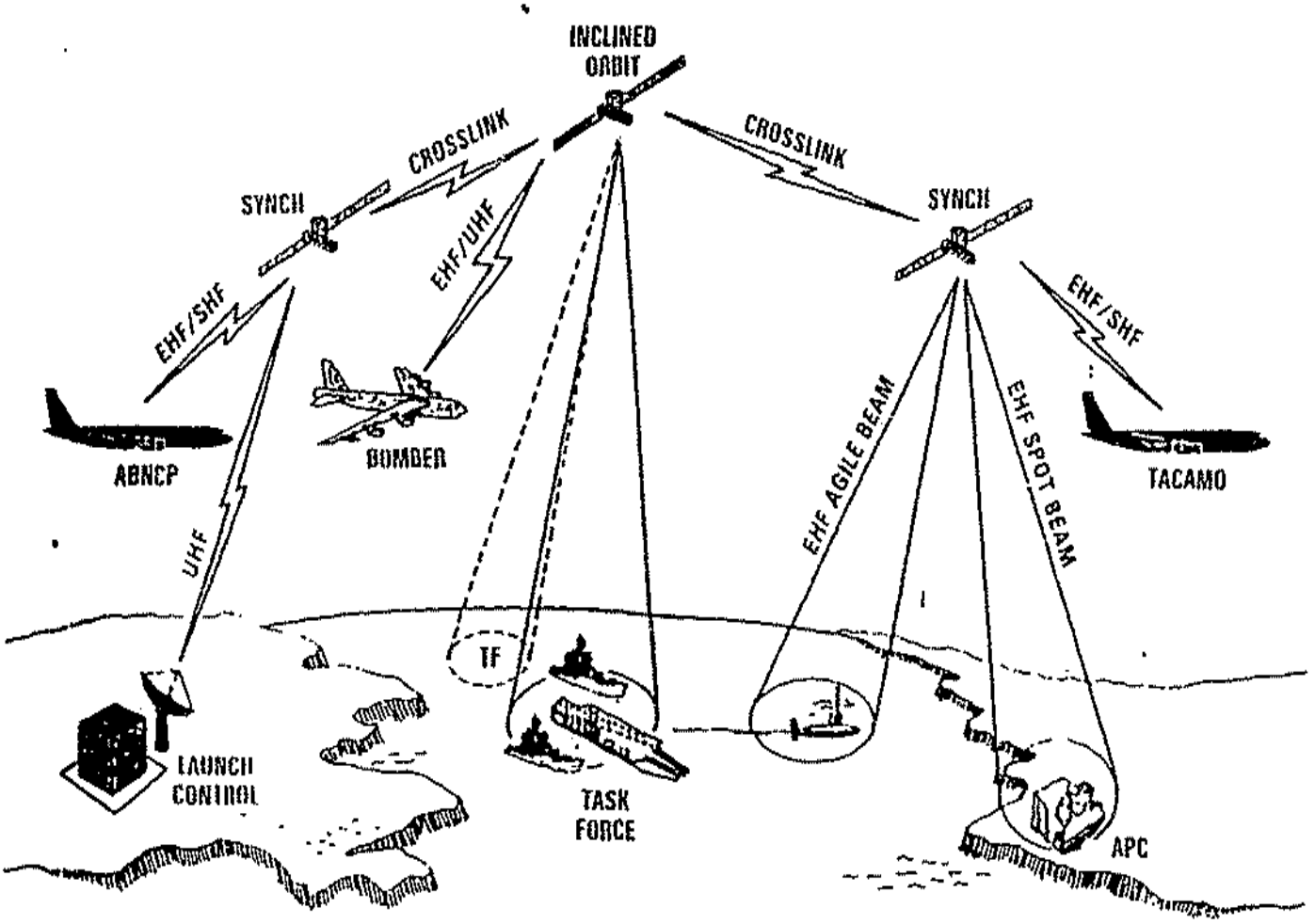

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Figure 2

equipment. It provides telemetry, tracking, and commanding (TT&C); auxiliary propulsion, and the DPS. The thermal control subsystem provides the temperature environment required by the bus subsystems and the payload. The electrical power and distribution subsystem provides the power requirements through the launch phase and during the satellites' life span.

(3) The communications payload provides uplink communications at EHF (44 GHz) and UHF (300 MHz) plus downlink at Super High Frequency (SHF) (20 GHz) and UHF (250 MHz). It provides crossbanding between EHF/UHF and UHF/SHF, crosslinking between Milstar satellites and communications security (COMSEC)/transmission security (TRANSEC) support. Three types of antennas provided on the satellites include

2. (U) Control Segment. The control segment provides the communications resource management and satellite control support required by the Milstar system.

a. (U) Communications resource management of the various Milstar networks is accomplished using Network Control Station (NECOS) facilities. These are Milstar terminals (MTs) and operators that are assigned specific network control privileges. A NECOS is responsible for management and control of the communications resources allocated to its networks. It will function using Milstar operating policies and procedures. The NECOS responds to the direction of the communications staffs of the Commander-in-Chief (CINC) or Service Commander to which the network belongs.

b. (U) Control of the Milstar satellites is performed by the Mission Control Segment (MCS). The MCS is composed of the following elements: the common-user Air Force Satellite Control Network (AFSCN), consisting of the Milstar Mission Control Complex (MCC) and the Remote Tracking Stations (RTSs); Milstar Operations Center (MOC); Constellation Control Stations (CCSs); a Operational Software Maintenance Facility (OSMF); and the Factory Test Complex (FTC). These elements provide both non-survivable and survivable support to the satellite constellation and non-survivable support to the terminal segment.

(1) (U) Non-Survivable MCS. Non-survivable components of the MCS include the AFSCN, MCC, MOC, SOMF and FTC.

(a) (U) The AFSCN receives telemetry from the spacecraft and transmits uplink commands using 13 RTSs to provide worldwide access. The Milstar MCC, through the AFSCN, provides the primary means for command and control of the spacecraft during prelaunch, launch, orbit insertion, on-orbit checkout and testing, and major anomaly resolution.

(b) (U) The MOC is the dedicated entity through which Air Force Space Command (AFSPACECOM) exercises its Milstar operational management responsibilities. MOC functions include planning, long-range scheduling, training, data base control and update, anomaly resolution management, systems analysis, user support, and communications resource management. The MOC includes a collocated CCS to gain access to the Milstar constellation and may control CCSs to expedite execution of its system management responsibilities.

(c) (U) The OSMF will provide operational support for: (1) MCS software and data base development and maintenance; (2) CCS software menu-driven procedures and display generation and maintenance; and (3) a system simulator to support validation of 1 and 2 above.

(d) (U) The FTC will provide satellite software and selected data base development and maintenance.

(2) (U) Survivable MCS. The survivable elements of the MCS are the deployed CCSs. Each consists of a Mission Control Element (MCE) with its associated software, a Milstar terminal, and qualified operators with proper authority and preplanned control procedures. See figure 3.

(a)

The CCSs, organized to fulfill a number of roles, are responsible for the day-to-day operational command and control of the Milstar constellation. See figure 4.

(b) (U) One CCS is assigned as the Designated CCS (DCCS). The DCCS is responsible for the continual command, control and coordination of the system. It delegates the various roles and workload to the other CCSs. It also maintains the operational status of the other CCSs. Through a succession procedure, any CCS can become the DCCS.

(c) During normal day-to-day operations (peacetime) a CCS can have responsibility for controlling one or more satellites as a Satellite Controller CCS (SCCS). There is a separate succession table of SCCS roles for each satellite.

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MILSTAR CONSTELLATION CONTROL STATION CONFIGURATION

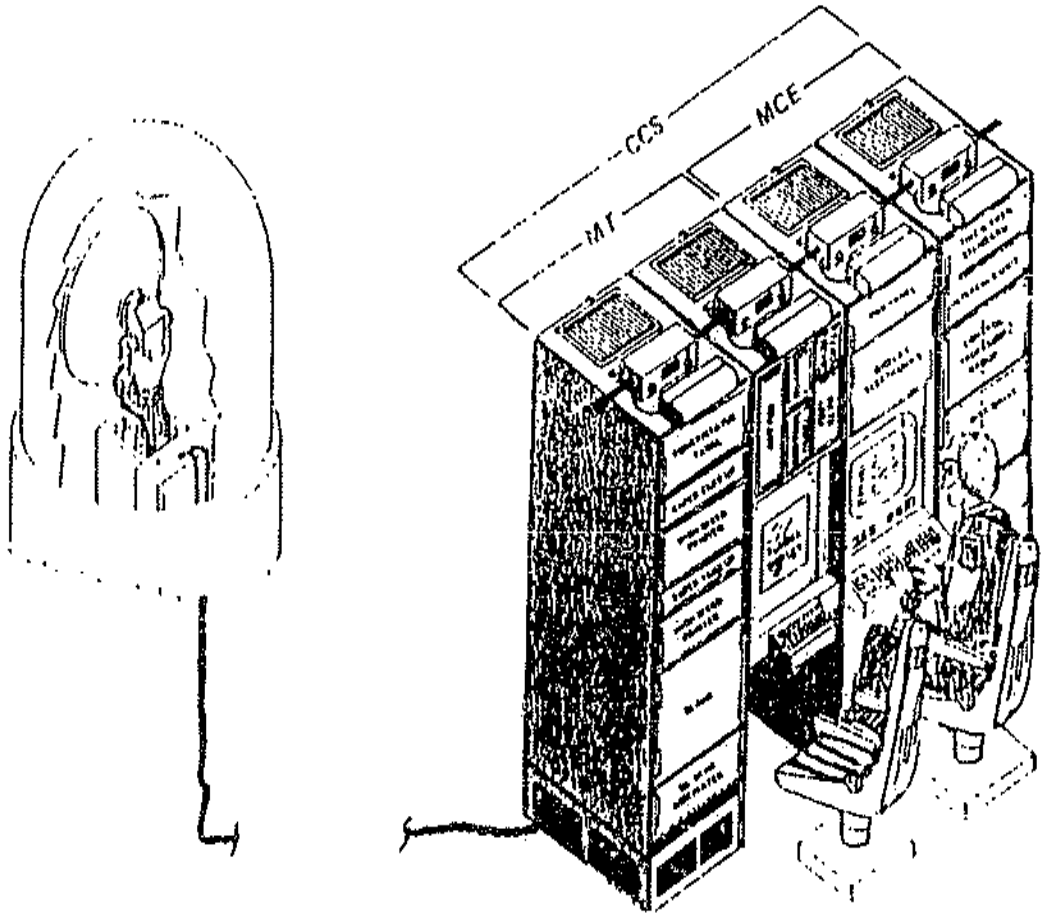

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Figure 3

MILSTAR CONSTELLATION CONTROL STATION PLATFORM SET (U)

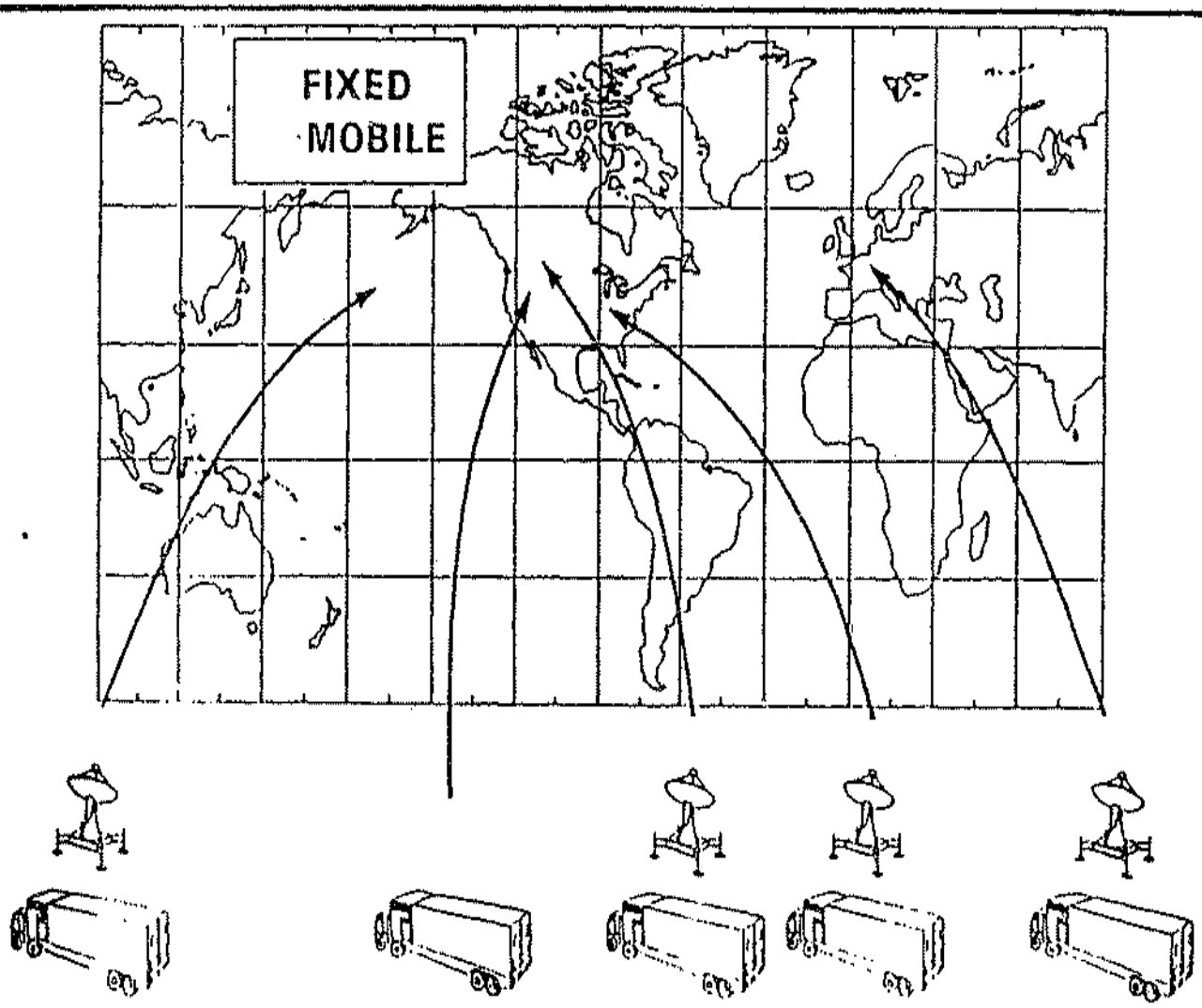

Figure 1

3. (U) Terminal Segment.

a. (U) The terminal segment is the user-communications component of Milstar and includes all terminals that are compatible with the system satellites. The terminal segment includes the control protocol to interact with the satellites to implement communications, on demand, by the user community.

b. (U) Milstar terminals (MTs) are under development by the Army, Navy, and Air Force. These terminals will be deployed on aircraft, submarines, surface ships, ground transportable platforms and ground fixed sites. The MTs will be interoperable and functionally similar, but will be tailored to meet specific Service and platform requirements. See figure 5.

c. (U) The Milstar Air Force terminal segment is comprised of two major classes of terminals - Command Post (CP) terminals and Force Element (FE) terminals. A Time Distribution Subsystem (TDS) will provide the terminal segment with an accurate time and frequency reference for terminal initialization. Within the class of CP terminals, there are: (1) airborne and ground EHF terminals; and (2) airborne and ground EHF/UHF terminals. The force element terminals consist of airborne and ground EHF force element terminals for specific applications where volume, weight, and power limitations exist. The Milstar EHF terminal will provide an EHF uplink capability and a SHF downlink capability. An "EHF/UHF terminal" is a terminal with the capabilities for EHF transmission and SHF reception plus UHF transmission and reception. See figures 6, 7, & 8.

d. (U) The Milstar Navy terminal segment is comprised of three classes of terminals: shipborne, shore, and submarine terminals. The Navy EHF Satellite Program (NESP) terminal uses the same Navy communications group cabinet and Navy Q-band high Power amplifier (HPA) for all terminals, and varies the antenna pedestal group between the three applications having a submarine antenna pedestal group (5.5 inch dish), and a ship/shore antenna pedestal group (7.1 inch shore dish and 34.5 inch ship dish). See figures 9, 10, & 11.

e. (U) The Milstar Army terminal segment is known as the SCOTT (Single Channel Objective Tactical Terminal) and consists of one terminal type. The SCOTT terminal consists of several black boxes, and a moderate gain antenna that is positioned a few meters away and tied to its host vehicle by a coaxial or fiber optic cable. See figure 12 & 13.

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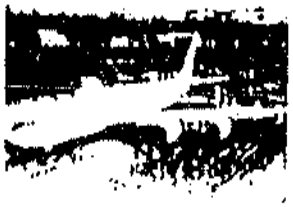
MILSTAR MULTISERVICE TERMINAL PROGRAM

NAVY



AIR FORCE

ARMY

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Figure 5

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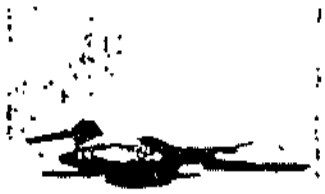
MILSTAR TERMINAL USERS

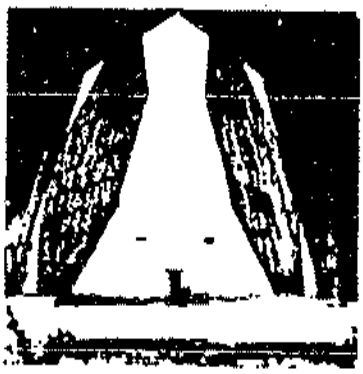
E-6A

RC-135

GROUND COMMAND POST

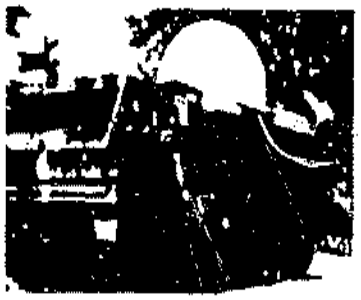


B-1



PAVE PAWS

MISSILE WEAPON SYSTEM



GROUND MOBILE
COMMAND POST

E-4B

SMALL ICBM

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Figure 6

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MILSTAR TERMINAL USERS

- NCA AND CINCs FOR SIOP EXECUTION (NEACP, WWABNCP, GROUND COMMAND CENTERS, etc.)
- RELAY OF SIOP EXECUTION (TACAMO, ALCC, SLFCS, etc.)
- TW/AA TRANSMISSION (CMAFS, BMEWS, PAVE PAWS, PARCS, etc.)
- MILSTAR MISSION CONTROL CAPABILITY (MMCC, CCS, STC, etc.)
- SIOP EXECUTION (B-52H, B-1B, MM/PK LCCs, etc.)
- C^2 FOR INTELLIGENCE COLLECTION (RC-135, ESC GROUND TERMINALS, etc.)
- TRANSPORTABLE HQS AND AFCC COMBAT COMMUNICATIONS GROUP
- NSNF WITH SIOP MISSION
- STRATEGIC AIRLIFT OPERATIONS
- TACTICAL AIR FORCES

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AIR FORCE TERMINAL C-18 TEST BED

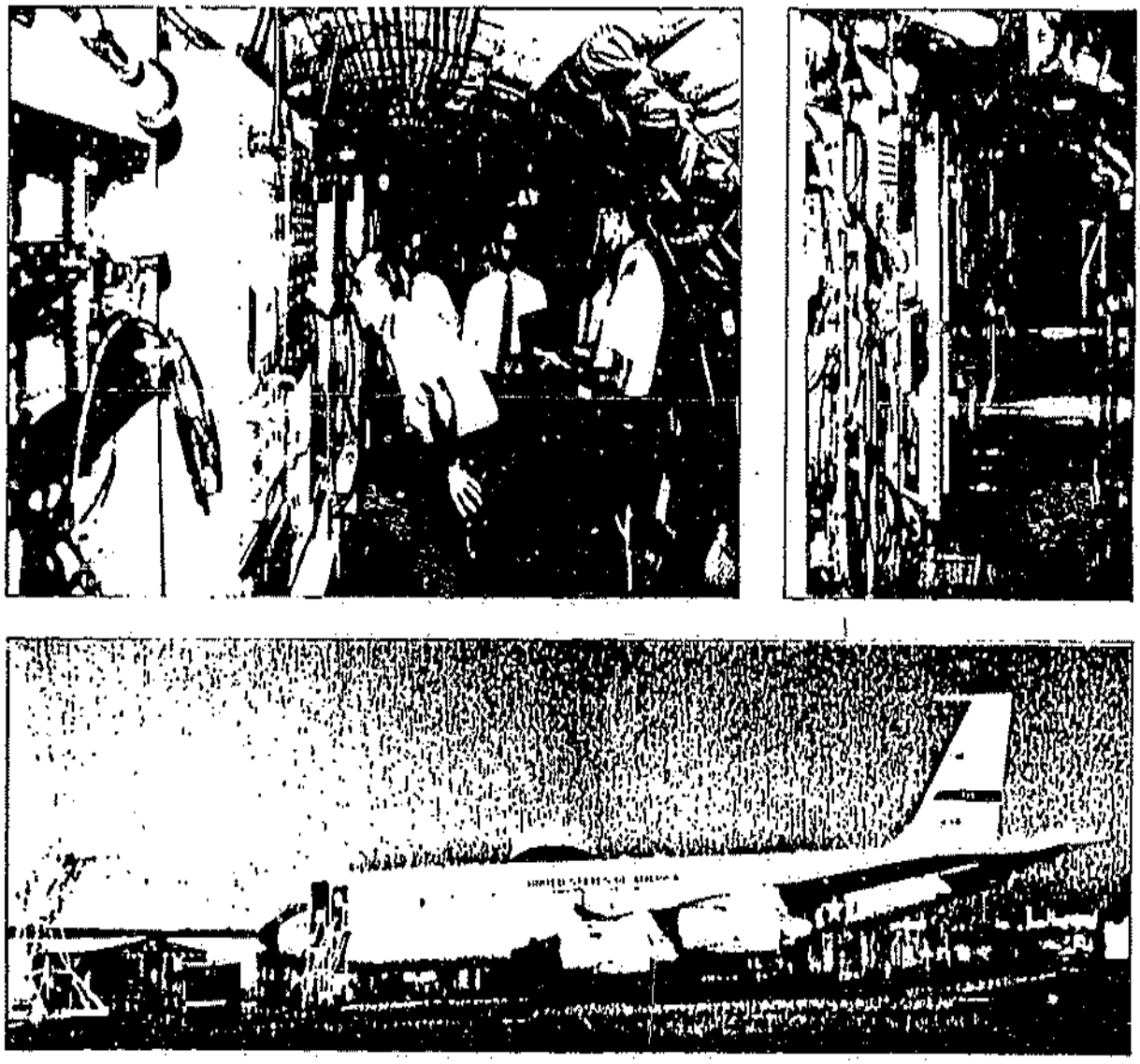

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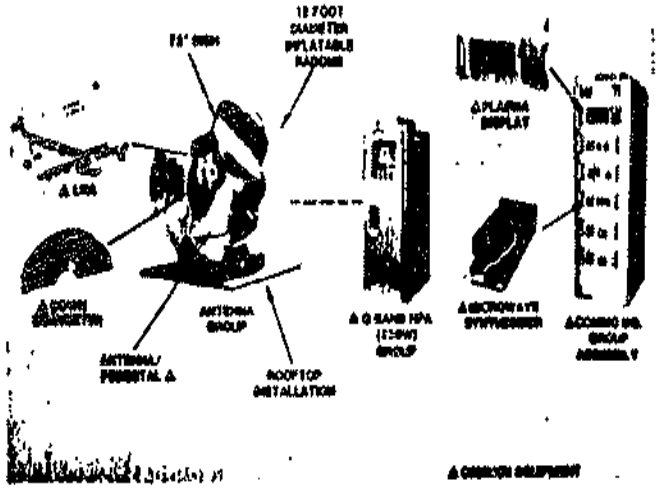
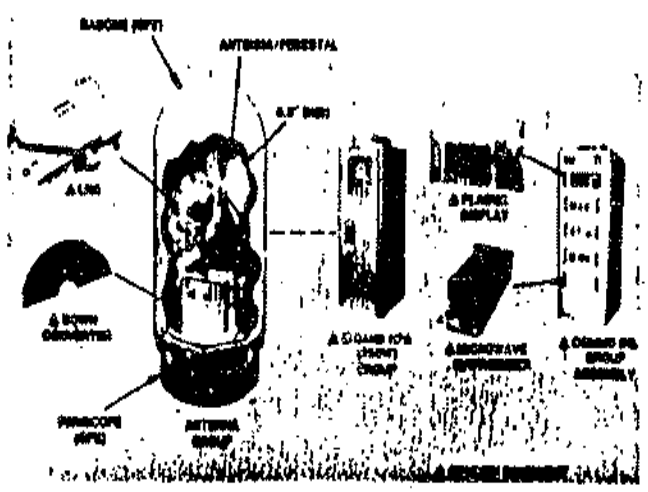
Figure 8

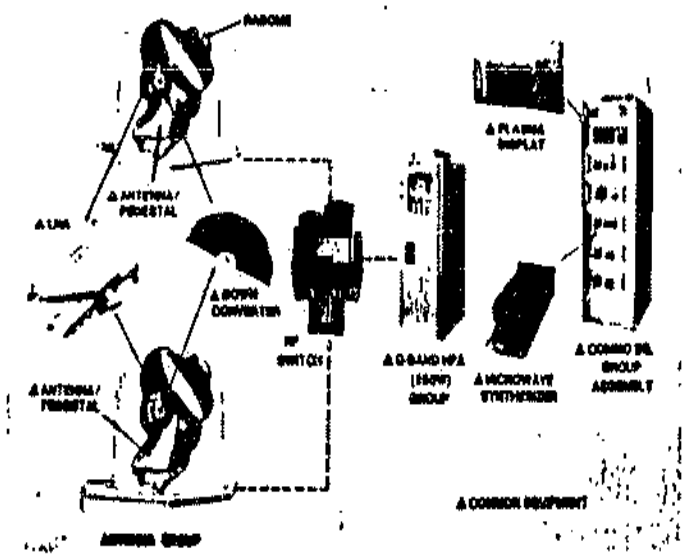
MILSTAR NESP TERMINAL PROGRAM



GROUND STATION
EHF TERMINAL



SUBMARINE EHF
TERMINAL



SURFACE SHIP
EHF TERMINAL

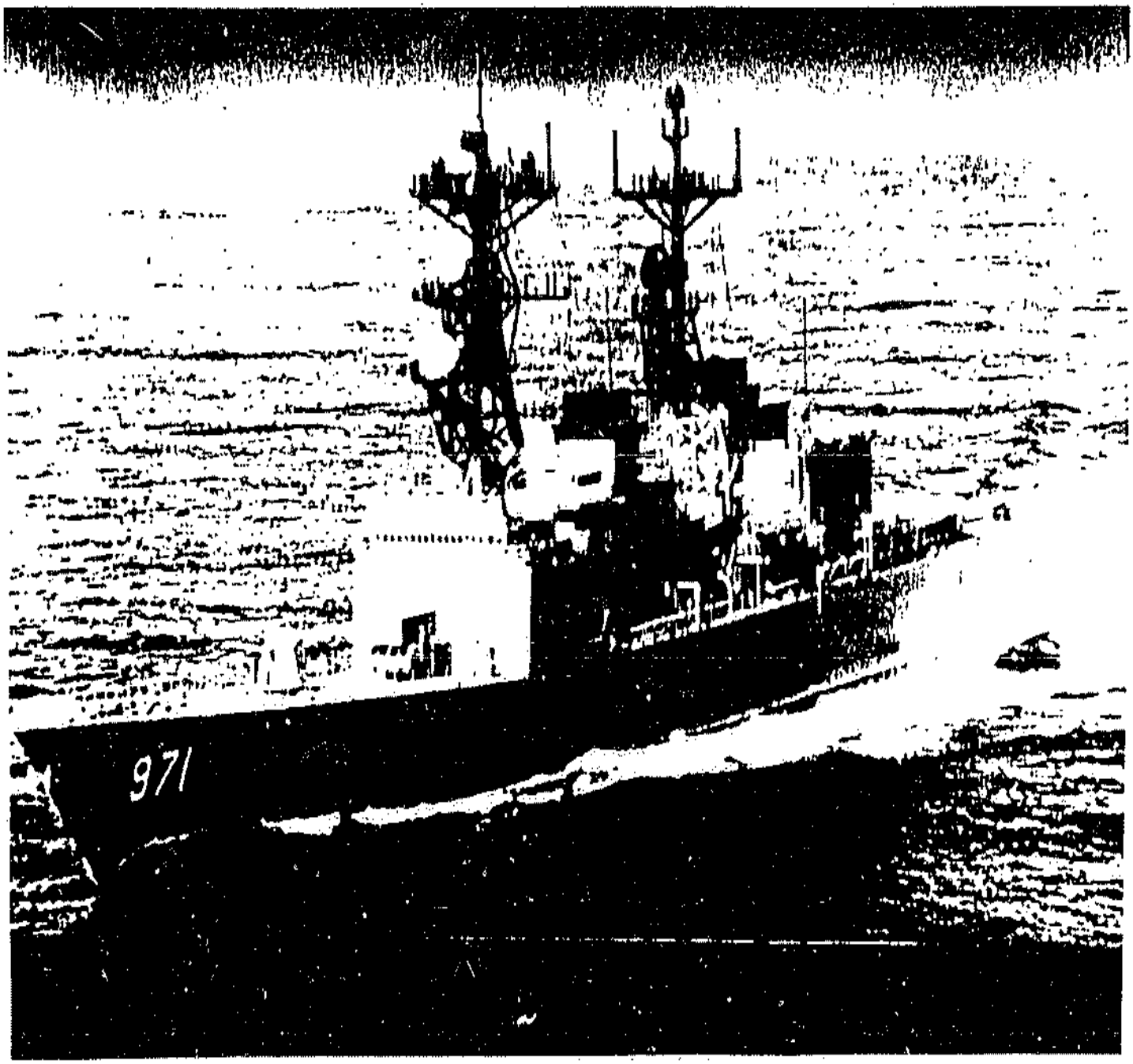


Figure 10

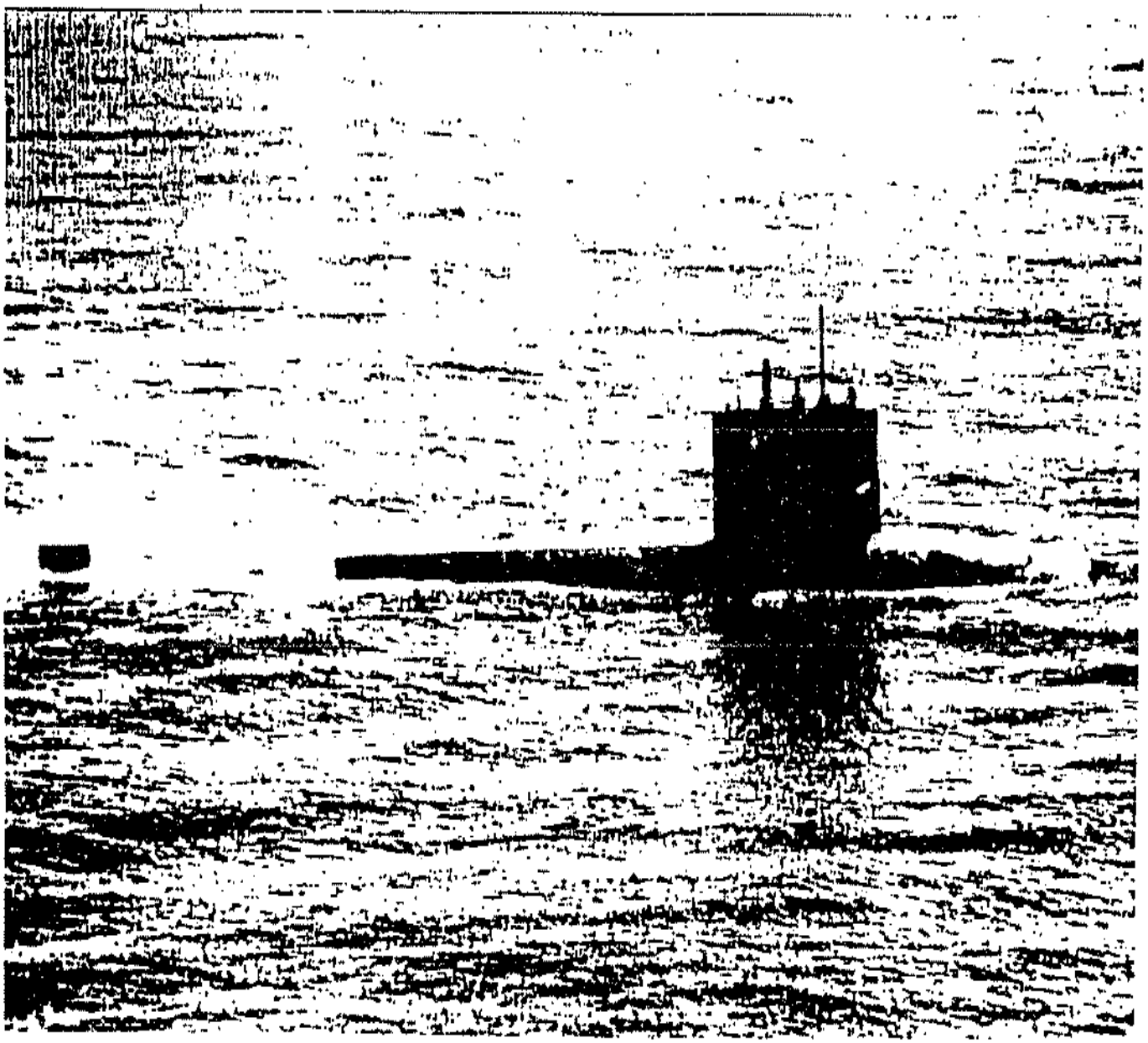
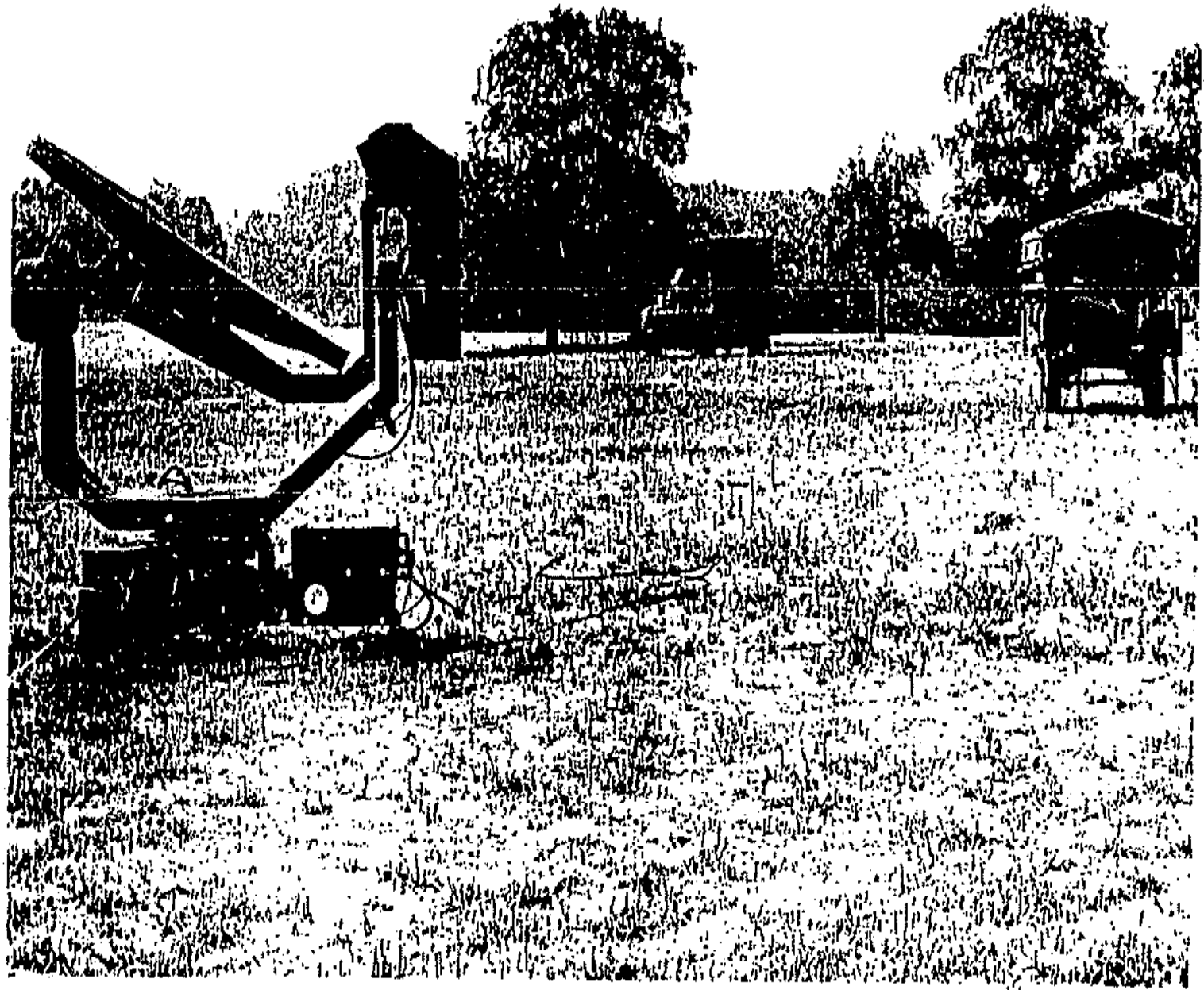


Figure 11



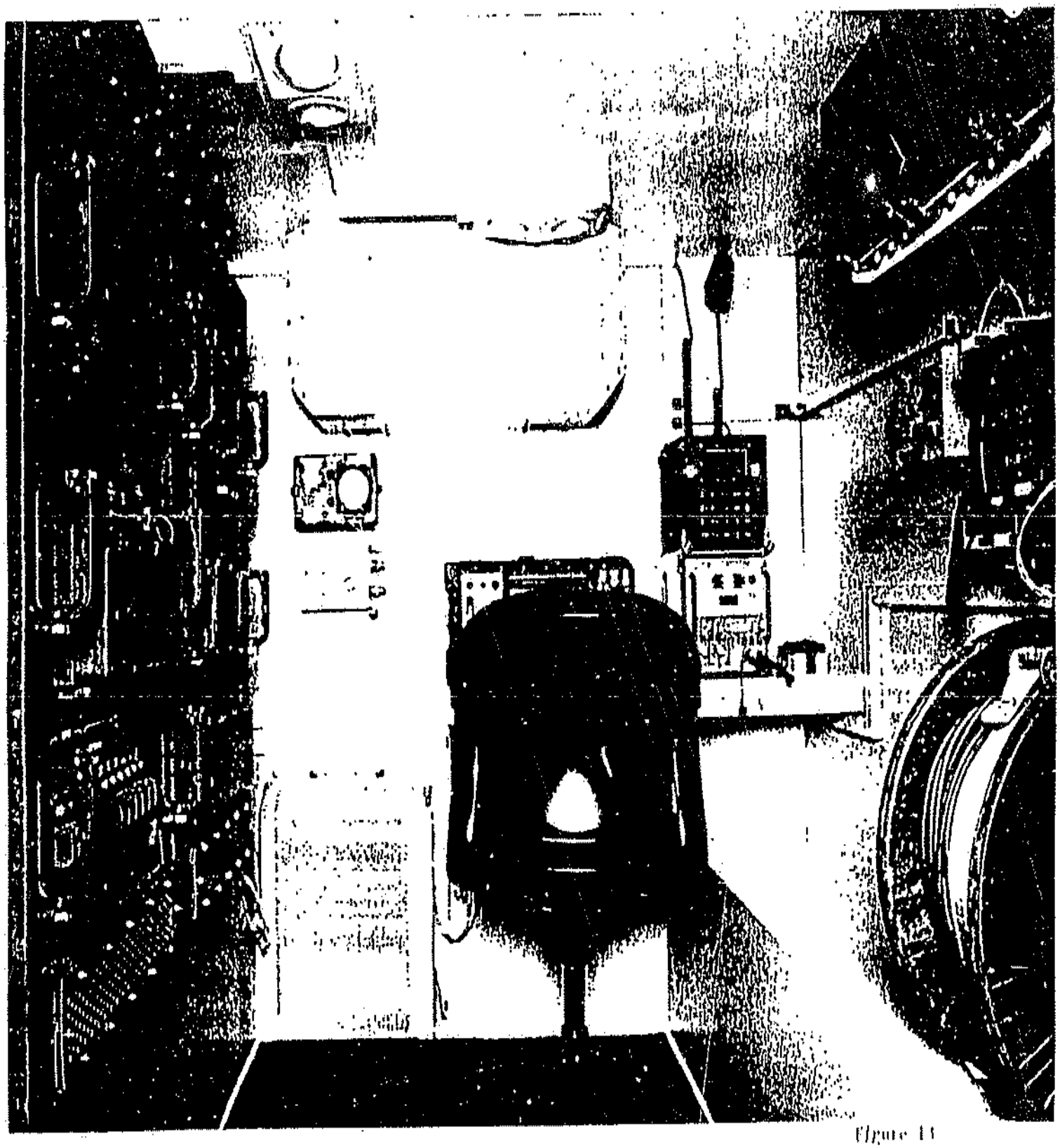


Figure 11

III. (U) Mission Area and Role.

A. (U) The Milstar Program is part of the Under Secretary of Defense for Acquisition mission area 333 -- Strategic Communications. Milstar will provide survivable communications among the National Command Authority (NCA), Joint Chiefs of Staff (JCS), Unified and Specified (U&S) Commands, the Services, and other agencies which employ strategic and tactical forces.

B. The need for Milstar is based on a national requirement for a single information exchange system that would provide minimum-essential, survivable and enduring communications to the NCA and the strategic and tactical forces of the Army, Navy, Air Force and Marine Corps.

The program has been declared to be one of the highest priorities by the President.

IV. (U) OPERATIONS CONCEPT/REQUIREMENTS

A. (U) The Milstar program is intended to provide minimum essential communications for command and control of strategic and tactical forces through all levels of conflict. Levels of conflict include peace, crisis, theater war (conventional and tactical nuclear), general nuclear war, and reconstitution. Milstar users are validated and communications resources are apportioned by JCS action. For example Milstar will satisfy user communications requirements associated with the command and control responsibilities of the NCA, plus the transmission of requisite intelligence and warning information. The Single Integrated Operational Plan (SIOP) CINCs, plus other CINCs, will receive and implement NCA direction via the Milstar system. Also, tactical forces can communicate using the Milstar system to execute their missions. The system will support other missions, such as reconnaissance, signal intelligence, and airlift. Some of the various networks that will use Milstar are Intelligence/Warning, NCA/CINC Conferencing, JCS EAM Dissemination, CINC Conferencing, Fleet Broadcast, Reportback (Bomber & Submarine), Theater Nuclear Force Management, Reconnaissance Operations, Navy Battle Group Command and Control, and Ground and Air Tactical Operations.

B. (U) The overall Milstar system management and control infrastructure will provide credible, reliable, and timely support to changing National Command Authority (NCA), Unified and Specified (U&S) Commands, and other user requirements through all levels of conflict. To accomplish this, the Milstar system control concept is based upon the principle of centralized management and decentralized execution. In order to ensure the integrity of the Milstar command and control structure to support system war fighting requirements, Milstar system control will be exercised and operated in peacetime as it will be operated in wartime. Reliance is placed on the ability to transfer critical system control functions from fixed management and control facilities to proliferated, survivable command and control stations in near-real-time without disruption of communications. Critical system control functions include satellite control and communications resource management and control.

1. (U) Satellite Control. Milstar satellite control is divided into spacecraft bus and payload control.

a. Spacecraft Bus Control. Spacecraft bus control is defined as the Telemetry, Tracking, and Commanding (TT&C) of the spacecraft to maintain its orbital position, monitor its status, manage its crosslink configuration, resolve anomalies, reposition it in support of user communications network operations,

and generate and distribute ephemeris. The Milstar Mission Control Segment (MCS)

accomplishes these TT&C functions.

b. (U) Payload Control. Payload control includes establishing the fundamental payload configuration and cryptographic key configuration. Establishing fundamental payload configuration includes assigning of antennas to missions and setting payload parameters to match and optimize apportioned resources. The Milstar MCS accomplishes these payload control functions.

2. (U) Communications Network Management and Control. Network management and control within Milstar is the responsibility of the individual users for their assigned resources. The communications staffs accomplish the planning and develop the procedures which are executed through the Network Control Stations (NECOSs). Management functions include establishing NECOSs, developing control procedures for efficient application and control of assigned resources, assigning user priorities within each network, establishing procedures for monitoring status, maintaining network quality control and discipline, and coordinating with Milstar management and control authorities. The users accomplish network control via the terminal to payload communications interface using access control messages and acquisition and tracking probes. Network control includes establishing and modifying user services, directing antenna movements of assigned spot beams, assigning user priorities within the network monitoring network status, and maintaining quality control and discipline.

C. (U) Operational Implementation. The operational infrastructure that supports Milstar command and control is responsive to the Chairman, Joint Chiefs of Staff (CJCS), the U&S Commands and other users. This structure establishes a single chain of command to the operational forces. Milstar operational tasking flows from the Joint Chiefs of Staff, through USSPACECOM, to AFSPACECOM for implementation and execution of satellite commanding and control.

D. (U) FLTSATCOM EHF Package (FEP).

1 (U) The primary goals of the FEP are to serve as an on-orbit testbed for the Operational Test and Evaluation (OT&E) of the Service Milstar EHF terminals and to provide a limited operational EHF capability to support Milstar requirements as validated by JCS.

a (U) The FEP will allow Service terminal testing with the space segment and will support proof of concept testing for terminal interoperability.

b (U) FEP will test EHF technology under operational conditions with a key objective being to help

develop and deploy a satellite communications system with an anti-jam, low probability of intercept capability.

2 After transition of the FEP networks to Milstar, the FEP will retain a resident operational capability. Operation of UHF SATCOM circuits on the FLTSAT host spacecraft will, to a great extent, dictate position of the spacecraft. Subject to this constraint, FEP could be used for contingency operations.

This would reduce the need to reallocate other Milstar resources. Any such use of FEP must take into consideration that the primary mission of the host satellite is to support UHF satellite communications.

E. (U) UHF Capability.

1 (U) The Milstar UHF Package will be used to provide transition connectivity for existing Fleet Broadcast (FLTBCST) and modified AFSATCOM terminals. The UHF package will also provide continuing support for those users that maintain a Milstar UHF capability.

2 (U) FLTBCST data is uplinked at EHF and crossbanded to UHF for satellite downlink without reformatting.

3 (U) The Milstar UHF users of the processed Milstar UHF transponder may communicate with other Milstar UHF users under the same satellites or via crosslinks to users under another satellite, as well as crossbanding to EHF/SHF Milstar users.

F. (U) Interoperability. The Milstar system will be directly interoperable among functional user groups through commonality in waveform, input/output devices, COMSEC and TRANSEC equipment, network control schemes, interleaving spans, hardware and software design, and operational procedures. Direct JCS and CINC connectivity to assigned forces, as described in the Joint Milstar Communications, Control, and Operations Concept (JMCCOC), needs to be preserved. Direct interoperability between Unified and Specified (U&S) command component forces as required in the JMCCOC must be assured. To achieve these goals the system employs, among other things, a number of signal processing functions on communications uplinks and downlinks that are designed to enhance communications efficiency in a stressed environment; to protect the system against jamming, and to provide low probability of intercept. End-to-End interoperability requires that these functions be implemented in a common fashion by all terminals in a network.

G. (U) Reliability. System reliability is defined as the probability that a specific mission will be completed without failure of mission-essential system functions. The reliability of Milstar is a combination of satellite, MCS, and terminal

reliability.

1. (U) Space Segment Reliability. Reliability models and allocations are required to satisfy the quantitive availability requirement. The satellite reliability program is in accordance with the requirements of Miltary Standard (MIL-STD)-1543. The satellite will be capable of maintaining specified performance for ten years in the face of identifiable wearout factors and expendable depletions up to the limit of the propellant load permitted by launch vehicle capacity. The satellite will have a predicted design life of ten years, following up to a maximum of three years of ground storage and ascent into orbit. The minimum mean mission duration for the satellite (including payload) is seven years.

2. (U) Mission Control Segment Reliability. This section identifies reliability requirements associated with the MCE. The reliability of other MCS elements is that associated with best commercial practices and off-the-shelf hardware, and is in accordance with MIL-STD-785 as tailored for Milstar. The MCE will have a basic reliability with a lower MTBF (theta one, in accordance with MIL-STD-781) of 600 hours and an upper MTBF (theta zero, in accordance with MIL-STD-781) of 1800 hours. The MTBF of MCE equipment is as follows:

a. (U) Control Processor Group - MTBF: 866 hours

b. (U) Display Group - MTBF: 4386 hours

c. (U) Interface Group - MTBF: 3703 hours

3. (U) Terminal Segment Reliability. For the terminal segment, mission reliability is defined as the probability that an airborne terminal can provide the required EHF communications over aircraft flight missions equal to or exceeding the following:

a. (U) .96 for airborne force terminals over a 12 hour flight mission.

b. (U) .96 for airborne command post terminals over a 16 hour flight mission.

c. (U) The serial hardware MTBF of the terminal equipment will be equal to or greater than the following values:

EHF ABNCP	350 hours
EHF GNDCP	700 hours
EHF ABNFE	400 hours
EHF GNDFE	750 hours
TDS	1750 hours
Navy ABNCP	400 hours
Navy Ship	300 hours

Navy Shore	300 hours
Submarine	300 hours
SCOTT	1000 hours

H. (U) Maintainability.

1. (U) Space Segment Maintainability. The maintainability program of the space segment is in accordance with MIL-STD-470, Maintainability Program Requirements. The satellite will incorporate maintainability features consistent with operations and logistics requirements and with maintainability design criteria of 5.4 of MIL-STD-470. The following general parameters apply:

a. (U) The satellite design will facilitate accessibility and removal, replacement of designated items during manufacturing, testing, and launch operations.

b. (U) Whenever possible, the removal of components will not require the removal of adjacent items.

c. (U) Where exact adjustments are required during satellite assembly, alignment references will be clearly inscribed and visually accessible for mating operations.

d. (U) The satellite will be capable of operating within specification limits after exposure in a nonoperating condition to the environments of ground transportation, handling, storage, launch vehicle integration, launch, and ascent to mission orbit.

2. (U) Mission Control Segment Maintainability. This section contains maintainability criteria associated with the MCE. Maintainability of the other elements is that associated with best commercial practice. The MCE hardware will have a mean maintenance corrective time (MCT) of not greater than one hour at the organizational level and a maximum MCT (MCTmax) of not more than three hours (95 percentile) when the corrective maintenance is accomplished at the organizational level.

3. (U) Terminal Segment Maintainability. A maintainability program will be established for each terminal type. This program will consist of tasks selected from MIL-STD-470. The MCT for terminal corrective maintenance will be 30 minutes at the organizational level, and the MCTmax will be 90 minutes. Terminal MTTR criteria is .5 hours for AF fixed, ABNFE, ground FE, ABNCP, Navy ABNCP, and SCOTT. Terminal MTTR for Navy ship, shore and submarine is 1.0 hours.

I. (U) System Survivability.

1. (U) Space Segment. The space segment has been designated to operate through all levels of conflict and to

survive through a reconstitution phase. The satellites possess:

a. (U) Low probability of intercept and resistance to radio frequency (RF) jamming on the uplink.

b. (U) Resistance to downlink signal intercept/exploitation and RF jamming.

c. (U) Reistance to satellite jamming.

d.

e

f. Capability to operate autonomously without ground intervention

g. A design approach to meet the Defense Intelligence Agency (DIA)/JCS approved threat

2. Mission Control Segment. The MCS has a requirement to support MIlstar through all levels of conflict without the support of the AFSCN or MOC.

3. (U) Terminal Segment. The terminals are survivable in the same manner as the MCS, e.g., proliferation and hardening. Physical protection of the Milstar terminals and action to be taken in case of terminal overrun or seizure must be included in all planning that addresses the use of Milstar.

J. (U) Terminal Segment Maintenance. The terminal maintenance concept provides for rapid replacement of modular assemblies with spare modules at the appropriate level to minimize terminal downtime. Built-in-test (BIT), Common Support Equipment (CSE), Peculiar Support Equipment (PSE), maintenance assistance modules, firmware diagnostics and well defined troubleshooting techniques documented in operation and maintenance manuals will be used to aid in the detection, isolation, and replacement of faulty LRUs. Air Force terminal

maintenance allows for flexible maintenance concepts to be used. The terminals are designed for three level maintenance: orgranizational, intermediate, and depot. The terminal easily facilitates a two-level maintenance capability as required by AFSPACECOM and AFCC.

K. (U) Manpower. Milstar manpower and support needs vary widely from complex facilities, such as the MOC and Milstar MCC, to isolated CCSs and Milstar Terminals requiring only a few operators and maintainers and a minimum of host-tenant or other support. Between these extremes there are a variety of manpower and support situations to be worked out for the Army, Navy, Air Force and Marine users of Milstar for the operational management of the system.

L. (U) Training. The Milstar training program has been developed to train personnel to support the Milstar program from the pre-operational phase to and beyond Milstar FOC. The goal of this training is to educate the required number of operators and maintainers on a timely basis for MCS, terminal segment, MOC, and Milstar MCC.

M. (U) Safety. MIL-STD-1574A applies for saftey programs associated with Milstar and Milstar operations. The MOC, Milstar MCC, and other operational elements will be required to conduct an occupation safety and health program in compliance with AFR 127-12, "Air Force Occupational Safety and Health Program."

N. (U) Electronic Compatibility.

1. (U) Electronmagnetic Compatibility (EMC) studies are being performed by the Electromagnetic Compatibility Analysis Center (ECAC). The tasks are directed at Milstar network and AFSATCOM acquisition upgrades that will utilize SCT and Milstar space communications assets. They are evaluating new signal processing and modulation techniques which are referred to as AFSATCOM UHF IIM (modified) and Milstar IIR (robust) used in the Air Force ground and airborne CP and FE terminals. Analysis is being performed to determine any potential interference interaction between existing UHF equipment and Milstar AFSATCOM upgrades planned for Air Force platforms.

2. (U) ECAC completed a preliminary study of Milstar EHF in February 1987. This was documented in a report entitled Preliminary EMC Analysis of Milstar Air Force Terminals (ECAC-CR-86-095) which indicated no serious potential EMC problems with the EHF and SHF portions of Milstar. The primary reason for this was relatively few systems operating in this part of the radio frequency spectrum.

O. (U) Further detail with respect to Milstar requirements

can be found in the:

1. (U) Joint Milstar Communications, Control, and Operations Concept (JMCCOC) Volume I, 1 Jun 89 (S/WNINTEL), and Volume II, 11 Aug 89 (S);

2. (U) Air Force Milstar System Operational Requirement Document (SORD), 27 Mar 89 (S);

3. (U) Milstar System Threat Assessment Report (STAR), Apr 89 (S).

4. (U) Milstar General System Specification, SR-1000 (U)

V. (U) PROGRAM MANAGEMENT

A. (U) Milstar is a Defense Acquisition Executive System (DAES) program. The DAES is a streamlined acquisition management system that establishes a straight programmatic line from the Defense Acquisition Executive (USD Acquisition) through the Service Acquisition Executive and Program Executive Officer (PEO) to the Program Director. Milstar consists of three segments, satellite, mission control, and terminals. The Milstar Satellite and Mission Control segments are managed by the Air Force with each Service unique terminal segment managed by the respective Service. Each Service is responsible to the DAE for ensuring segment acquisition, management of funds, and representing the designated segment in the respective service planning, programming, and budgeting process.

B. (U) The Air Force as the Executive Agent for the Milstar Satellite Communications System is responsible for:

1. (U) Implementing Milstar system level management and satellite control;

2. (U) Designating the Milstar Operational Manager;

3. (U) Developing satellite replenishment plans, orbital locations, and sparing philosophy;

4. (U) Convening Milstar meetings with the services, agencies, OJCS, and CINCs.

C. (U) The Milstar Joint Program Office (JPO) functions as the system manager during the validation, full scale development and acquisition phase of the program. The scope of this responsibility includes the Milstar satellite, FLTSATCOM EHF package, mission control, and EHF terminals. This includes the development and control of system specifications, inter-segment interface definition and configuration control, system test and evaluation, and funding and schedule coordination. The JPO is located at Space Systems Division, Los Angeles AFS, CA and is headed by an Air Force O-6 as the Joint Program Manager.

D. (U) The Joint Terminal Program Office (JTPO) is responsible to the JPO for coordinating the engineering development of the EHF satellite terminals for the Services. The purpose of the JTPO is to minimize duplication of effort and cost, maximize standardization, commonality, and logistic supportability, and insure required interoperability. The Services develop and procure terminal equipment necessary to meet their needs under the direction of the JTPO. The JTPO is located at COMSPAWARSYSCOM, Crystal City, VA, and is headed by a Navy O-6 who works directly for the Joint Program Manager. The respective Service terminal programs are each headed by an

O-6 and are located as follows.

1. (U) Air Force Milstar Terminal Program - Hanscom AFB, MA.

2. (U) Army Terminal Program (SCOTT) - Ft Monmouth, NJ.

3. (U) Navy EHF SATCOM Program (NESP) - Crystal City, VA.

VI. (U) ACQUISITION STRATEGY

A. (U) Satellite and Mission Control. In April 1981, the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD/C3I) issued a memorandum directing the formulation of the Milstar Satellite Communications Program. After a brief concept validation and exploration phase, a full scale development contract was awarded to Lockheed Missile and Space Corp. (LMSC) in Jun 83 with options for six satellites. A post development production contract for satellites seven and beyond will be awarded after successful launch and system demonstration.

B. (U) Air Force Milstar Terminals.

1. (U) Background

a. (U) During concept validation or phase 0 (zero), the MILSTAR Terminal Program Office developed system and terminal segment functional specification and specified Air Force terminal requirements. Three study contracts were competitively awarded in April 1982 to Hughes Aircraft Company, Raytheon Company, and Motorola Inc. These contracts directed investigation into technical definition/trade-off issues and developed critical hardware and software brassboards.

b. (U) At the completion of the Concept Validation Phase, two Full Scale Development (FSD) contracts were awarded (September 1983) for a MILSTAR terminal Phase I design and development effort through Critical Design Review (CDR). Two competitive teams were awarded Phase I contracts: Hughes M/A-COM Government Systems, Inc. and Raytheon Company - Rockwell International Corporation, and Bell Aerospace.

c. (U) Phase I of the MILSTAR Air Force Terminal Program competitively developed baseline designs for MILSTAR UHF and EHF terminals. At the completion of development, both teams presented their designs for evaluation. The Phase II selection was based upon evaluation of critical specifications, the overall design approach, the brassboard test results, and cost considerations.

d. (U) In June 1985, Raytheon and its principal subcontractors, Rockwell International and Bell Aerospace, were awarded the Phase II FSD Contract, F19628-85-C-0004. The Phase II effort completes the FSD design and fabrication of all PME and PSE, includes development, test, and initial operational test of FSD units, and delivers 27 Engineering Development Model (EDM) terminals. It also certifies the MILSTAR leader/follower participants and defines the full production baseline.

e. (U) During Phase II FSD, terminals have been

configured for EHF/UHF Airborne Command Posts (ABNCPs), EHF/UHF Ground Command Posts (GNDCPs), EHF Airborne Command Posts (ABNCPs), EHF Airborne Force Elements (ABNFEs), EHF Ground Sensor Sites (GNDSSs), EHF only Ground Command Posts (GNDCP), Transportable EHF/UHF Command Posts and EHF only Transportable Command Posts.

2. (U) Leader/Follower and LRIP Contracting Approach

a. (U) MILSTAR has proceeded under a leader/follower strategy as approved by the Secretary of the Air Force during the Phase II FSD source selection. Under the FSD contract each contractor (Raytheon as the prime contractor and Rockwell and Bell as subcontractors) had lead responsibility for designing and developing selected terminal LRUs. Upon completion of the design of each LRU, the developer is responsible for the transfer of technology to the follower. The follower is responsible for fabricating and qualifying at least two of each LRU designed by the leader.

b. (U) The acquisition approach for LRIP was to award two sole source FPIF contracts, one to Raytheon and one to Rockwell. Both will implement the MILSTAR Leader/Follower Plan and thus maintain the integrity of the MILSTAR Leader/Follower Program throughout LRIP. Raytheon and Rockwell will each be responsible for the delivery of complete terminals. The use of two prime contracts will ensure that each develops independent production capabilities, and will allow the Air Force to evaluate the performance of each prior to FSP.

c. (U) The LRIP terminal buy is equitably split between Raytheon and Rockwell with each providing airborne and ground terminals. Terminal integration responsibilities will be split between Raytheon and Rockwell to ensure that both develop integration expertise. Bell Aerospace is a directed subcontractor to both primes. The plan to procure complete terminals minimizes the Government's integration risk and ensures competitive sources for future EHF COMSAT terminal acquisitions.

3. (U) LRIP Procurement

a. (U) Terminals, Time Distribution Subsystems (TDS), Peculiar Support Equipment (PSE), spares and technical data will be procured during LRIP. Installation support will be included and provided to the 'user' command installation efforts.

b. (U) MILSTAR Terminal Program is a "produce to budget" effort. Quantities to be procured will depend on available funding.

c. (U) The contracts will be structured to all for variation in terminal quantities should user needs require. Fifty-five (55) LRIP terminals with spares (spares acquisition integrated with production - SAIP) will be procur during LRIP years (FY89, FY90 and FY91). This represents les than 6% of total program requirements, nine-hundred thirty (930) EHF and EHF/UHF terminals.

4. (U) Full Scale Production Strategy: Current pla: is to award contracts for Full Scale Production using price competition among qualified sources. Some portion of the procurement will be awarded to both contractors during the initial FSP buys in order to maintain an adequate industrial base and competitive sources.

5. (U) Low Volume Force Element (LVFE): Developmer of a second generation LVFE terminal required to meet high performance platform (i.e. B-1B) volume and weight constraint is scheduled to start in FY91 with production start scheduled for FY94.

C. (U) Navy EHF SATCOM Program (NESP).

1. (U) The NESP acquisition strategy, as identified in Acquisition Plan 83-25, is a "3-2-1" procurement which maximized competition throughout development and production. In 1979, contracts were awarded to Raytheon Company, Harris Corporation, and Rockwell International for system definition and concept demonstration. In 1982, Raytheon and Harris were selected to proceed to Full Scale Development (FSD). The downselection between Raytheon and Harris was conducted prior to FSD completion for funding reasons. In 1986, Raytheon was awarded a firm fixed price (FFP) contract for FSD completion and initial limited production quantities for program years FY90 through FY94. A complete analysis of Raytheon's cost proposal was conducted by COMSPAWARSYSCOM prior to award. Development costs have also been controlled by COMSPAWARSYSCC Configuration Control Board (CCB) review and analysis of all Engineering Change Proposals (ECPs). The FSD portion of Raytheon's contract contains award fee provisions based on schedule and performance. Production incentives are tied to warranty requirements and there are liquidated damages provisions for late deliveries. The FSD phase of Raytheon's contract includes a Producibility Engineering Program (PEP) effort which runs in parallel with the completion of FSD. PE will ensure an orderly transition into the LRIP phase which : planned for FY90/FY91.

2. (U) Full Scale Production is scheduled to start in FY92. Production quantities for FY92, 93, and 94 will be provided through the present multi-year procurement by Raytheon. A full and open competition will be conducted for production raquirements in FY95 and beyond. An Independent

Cost Estimate (ICE) of the NESP requirements for R&D, OPN, and O&S was conducted in November 1988 by the Naval Center for Cost Analysis (NCA). The ICE was within 2% of SPAWAR's estimated funding requirements. The production cost estimates have been controlled not only by design to unit production cost goals established early in the program, but also by the firm fixed prices established in the production contract. The production/deployment schedule has been designed to coincide with other major SHIPALT actions to minimize fleet disruption.

D. (U) Army Single Channel Objective Tactical Terminal (SCOTT). After a successful Advanced Development phase in which prototype terminals were built by MIT/Lincoln Laboratory, the SCOTT program was initiated with the approval of an acquisition strategy by the Under-Secretary of the Army in Mar 85. Development commenced in Dec 85 with the award of a Firm Fixed Price (FFP) Full Scale Engineering Development (FSED) contract to Magnavox Electronic Systems Company, Ashburn, VA. The Magnavox contract is for development of 15 FSED terminals, three of which are built on production tooling. After a successful Operational Test and Evaluation, the SCOTT program will enter Full Scale Production, currently scheduled for early FY92.

E. (U) Further detail with respect to Milstar contracting, cost, and schedule can be found in the:

1. (U) Selected Acquisition Report for the Milstar Satellite and Mission Control segment, Mar 90 (SAR)

2. (U) Selected Acquisition Report for the Air Force Milstar Terminal segment, Mar 90 (S)

3. (U) Selected Acquisition Report for the Navy EHF SATCOM Program (NESP), Mar 90 (S)

4. (U) Selected Acquisition Report for the Single Channel Objective Tactical Terminal (SCOTT), Mar 90 (U)

VII. (U) IMPLEMENTATION.

A. Detailed system implementation plans and schedule can be found in the Joint Chiefs of Staff's (JCS's) draft Milstar System Initial Operational Capability (IOC) Definition. The Milstar system IOC definition is based on the JCS validated essential space and mission control requirements and user identification of essential networks and required connectivity. At IOC, Milstar will provide a command and control communications capability to the strategic and tactical US military forces to support:

2.

3.

B. To provide the above IOC capability, Milstar will employ four satellites, two in low inclined and two in high inclined orbits, EHF communications terminals (EHF/UHF and EHF command post and EHF force element), and two constellation control stations (CCSs), one fixed and one mobile, will be located in each satellite coverage area. Based on the current satellite launch schedule and the Air Force, Army, and Navy production and installation schedules, IOC will be achieved by The satelite launch and terminal installation schedules to support IOC are listed below. Note, the CCS implementation schedule is not specified in the draft IOC definition.

	FISCAL YEAR							
SEGMENT	90	91	92	93	94	95	96	TOTAL
(U) AIR FORCE TERMINALS	7	1	10	35	36	31		120
(U) ARMY TERMINALS		7			73	49		129
(U) NAVY TERMINALS				21	33	54		108

C. Milstar Full Operational Capability (FOC) is defined

VIII. (U) MILSTAR INITIAL OPERATIONAL TEST AND EVALUATION (IOT&E). The objective of the IOT&E program is to evaluate the operational effectiveness and suitability of the Milstar System in meeting user mission requirements. The IOT&E results will support both production decisions and operational turnover. Milstar IOT&E will be conducted in three phases.

A. (U) In the first phase, each service OT&E agency will conduct individual testing of their respective terminals. Terminal IOT&E will verify that the terminals satisfy service unique requirements, and are interoperable for joint communications requirements.

B. (U) In the second phase of IOT&E, the Air Force Operational Test and Evaluation Center (AFOTEC) will evaluate the effectiveness and suitability of the mission control segment in providing operational control.

C. (U) Multiservice testing will be conducted using the first and second on orbit satellites. The multiservice IOT&E will be conducted from a mission perspective and will evaluate the system in terms of its capability to satisfy the joint operational requirements documented in the Joint Milstar Communications, Control, and Operations Concept (JMCCOC).

D. (U) Key Field Test Completed.

1. (U) Uplink and downlink waveform compatibility between Milstar UHF and the existing UHF SATCOM systems.

2. (U) Each service demonstrated terminal-to-payload interface compatibility and interoperability using the enhanced design verification model (EDVM).

3. (U) The first two phases of over-the-air interoperability (using FEP) testing between the three service terminals was completed.

4. (U) The interface compatibility testing between the Mission Control Element and the satellite and terminal segments started.